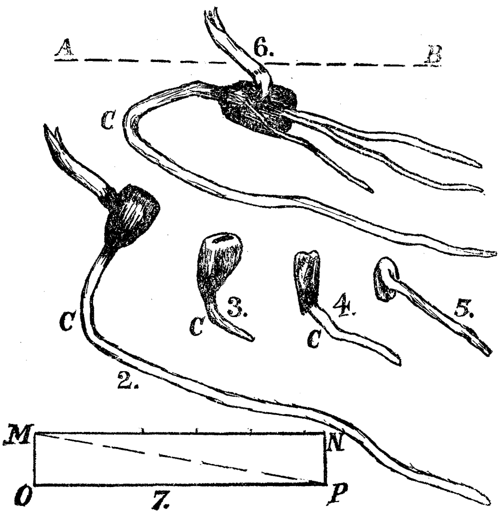
rotation commenced. The direction of the stems can be well seen in figs. 6 and 2.

The cause of this mode of growth being, of course, the outward radial tendency of the plantlet in reaction upon the centripetal force acting through the



FIGS. 2–7.

soil, we may put the intensity of the new modifier equal to the centripetal acceleration, $\left(\frac{2\pi}{T}\right)^2 r$. This gives a centrifugal 'force,' so called, of 5,348 degrees, or 5.4 g, at a radius of six inches. If we put $M\,O$ (fig. 7) equal to gravity, and $M\,N$ equal to this centrifugal 'force,' then, for an ideal case, $M\ P$ will represent the resultant direction of the growing rootlet. This is but very loosely approximate to the observed positions, as might be expected.

CHAS. S. SLICHTER.

North-western university, Evanston, Ill., June 27.

Perforations in wool fibre.

In my investigations in wool fibre I have found some defective hairs that were perforated in places, evidently while growing on the sheep's back. As the perforations are perfectly circular, it would indicate that they are made by some creature at present unknown. Would it not be worth the while of some of your scientific readers to examine into the matter, and discover, if possible, what the perforator may be, and whether it is likely to remain as little injurious as at present?

JOS. M. WADE.

Boston, July 7.

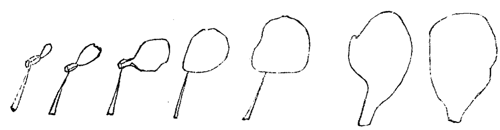
The evolution of petals.

In Mr. Grant Allen's interesting treatise on the 'colors of flowers,' the first chapter deals with the evolution of petals from stamens, in which the author shows that petals are but specialized stamens set apart for the purpose of attracting insects. His proofs are such that no candid reader is likely to finish the chapter, and apply its principles to the flowers he meets in his every-day walks, without being convinced of the correctness of the author's views. The gradual development from stamen to petal can be seen in most of those cultivated flowers which exhibit a tendency to become double, as well as in those which have already become so.

But it would seem that Mr. Allen had overlooked one point in the method of evolution. Throughout the entire book the idea is given that the process of evolution begins by the *filaments* becoming flattened. Thus, on p. 11, taking the English water-lily (Nymphea alba) as a typical example, the author says, —

"In the centre of the flower we find stamens of the ordinary sort, with rounded stalks or filaments, and long, yellow anthers full of pollen at the end of each; then, as we move outward, we find the filaments growing flatter and broader, and the pollen-sacs less and less perfect; next we find a few stamens which look exactly like petals, only that they have two abortive anthers stuck awkwardly to their summits; and finally we find true petals, broad and flat, and without any trace of the anthers at all. Here, in this very ancient though largely modified flower, we have stereotyped for us, as it were, the mode in which stamens were first developed into petals, under stress of insect selection."

Again, on p. 115, he says, "It has been objected by two or three authoritative critics, that the original petals need not have been yellow, because they represent the flattened filaments, *not the anthers*;" and the author goes on to show that filaments are usually of the same color as the petals.



FLOWER OF CYDONIA VULGARIS, SHOWING TRANSFORMATION OF STAMENS TO PETALS.

An examination of a number of our common flowers shows, that, in many cases at least, the evolution of the petal begins with the *anther* rather than the filament. Thus, in the common quince (Cydonia vulgaris), many of the flowers possess stamens of which the anthers have become petaloid, while the filaments are of the normal type. Some of the anthers are merely flattened on one end; others are more so; while in others the anther has become a flat, white, petaloid disk on the end of a normal filament. From this, every gradation can be seen to the normal petal. In this instance, not only the pollen-walls, but the pollen itself, has become petaloid before the filament has been at all modified. In the flowers of the mock-orange (Philadelphus coronarius) the same transition often occurs, as well as in many of the double flowers of our gardens and conservatories.

CLARENCE M. WEED.

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Metallic circuits in cables.

When the full text of Mr. Gisborne's paper, read before the Royal society of Canada, is published, it will be shown that his anti-induction experiments with all metallic circuits in underground cables were made in connection with an electric target, for which a prize medal was awarded to him at the London exposition of 1862; and the diagrams attached to his paper will also explain why parallel metallic circuits in a *multiple* cable, unless twisted according to his design, will *not* eliminate induction of currents in